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The Spruce-trees of Eastern North America.

THE best descriptions and figures of the Spruce-trees which are indigenous in the eastern United States were published in London in 1803, in the first of Lambert's splendid folios devoted to the genus Pinus. Before the appearance of this work botanists referred all our Spruces to two species, the Black Spruce and the White Spruce, but Lambert, from material obtained in Newfoundland, recognized a third species which he called the Red Spruce. This species, however, has generally been neglected by botanists, who have either overlooked it entirely or have considered it a variety of the Black Spruce, although the late Dr. Lawson, of Halifax, who had exceptional opportunities for studying these trees in their native forests, insisted that the Red and Black Spruces were distinct trees, and his views will certainly be shared by every one who sees them alive and understands their distribution and peculiarities.

The Black Spruce, the Picea nigra or Mariana of botanists, is an inhabitant of cold, wet sphagnum swamps, where it rarely grows sixty feet high or lives a hundred years. It is a tree of open habit, with rather remote branches which sweep downward in slender, graceful curves. The slender branchlets are covered with fine rusty pubescence, and the leaves are blue-green and very glaucous. The cones are broadly ovate and from three-quarters of an inch to an inch and a quarter in length, with rigid scales conspicuously erose on the margins; they are strongly incurved at the base, dark purple when fully grown, and remain on the branches for many years. Trees stunted by wet and cold often begin to produce cones when only four or five feet high. The Black Spruce is common in Labrador and Newfoundland and ranges to Hudson's Bay and much farther north-westward, but probably does not reach the shores of the Pacific Ocean or as high latitudes as the White Spruce, although the confusion which has existed with regard to these trees makes it impossible to speak with confidence of their distribution in the Arctic Circle, or even on the waters of the upper Mackenzie River; it is common in the maritime provinces of Canada, following down the Atlantic coast to New Jersey, although south of Cape Ann it is not common in the coast region, being confined to a few isolated swamps; it ranges westward to Manitoba and northern Minnesota, and southward to Pennsylvania, Michigan and Wisconsin, and is said to grow in elevated swamps on some of the high mountains of Virginia. The Black Spruce, however, is a rare tree on the Appalachian hills, although Black Spruces do occur on the White Mountains of New Hampshire and in several Pennsylvania swamps. It is, however, the only Black Spruce of the states surrounding the Great Lakes and the only Spruce which reaches the Atlantic coast south of Cape Ann. As a timber tree the Black Spruce has little value and probably has never been manufactured into lumber, except, perhaps, for local use. In cultivation it loses its beauty early, growing thin and straggly, and is one of the least desirable of all conifers as an ornamental tree.

The Red Spruce is a tree often one hundred feet and occasionally one hundred and twenty feet high, with a tall trunk three or four feet in diameter; short, slender, slightly pendulous branches which form a narrow, compact, pyramidal head; stout branchlets clothed with rusty pubescence and dark green lustrous leaves. The cones are oblong and from two inches to two inches and a half long, with thin, rigid, entire or obscurely erose scales, and are straight at the base, light green, sometimes slightly tinged or streaked with purple, and fall within a year after ripening. The Red Spruce grows in Labrador and Newfoundland; it occurs in the Canadian maritime provinces, although less commonly than the Black and White Spruces, and follows down the Atlantic coast to the neighborhood of Rockport, Massachusetts; it is the common Spruce-tree of all the interior regions of New England, New York and Pennsylvania, and ranges south along the Alleghany Mountains to the high peaks of North Carolina and Tennessee. As far as the United States is concerned, it is an Appalachian tree, and does not extend into the lake region. It is the upland Spruce of the northern states and the common timber Spruce of New England, New York and Pennsylvania, nearly all the spruce lumber of these states being obtained from this tree, which is the Black Spruce of lumbermen and most botanists.

The Red Spruce, which was formerly occasionally planted as an ornamental tree in New England, has generally escaped the notice of gardeners. In cultivation it is a beautiful long-lived tree of excellent color and habit, with the general appearance of the Oriental Spruce, Picea orientalis, which, in the northern states at least, does not surpass it in beauty, while it is less hardy and grows less rapidly.

The White Spruce, Picea Canadensis, differs from the Red and Black Spruces in its stouter, pale and glabrous branchlets and larger buds, in its bluer and more glaucous foliage, although on some Black Spruces the leaves are as glaucous as those of the White Spruce, and in the thin entire cone-scales, which are so flexible that a dry cone is easily compressed between the fingers, while the cones of the other species break under slight pressure. The strong, disagreeable, wildcat odor of the bruised leaves of the White Spruce distinguishes it from all other conifers, making it easy to recognize this tree at all seasons of the year. The White Spruce is common in Labrador and Newfoundland; it is probably the common Spruce of the subarctic and arctic forests which stretch across the continent, and appears to reach the eastern base of the Rocky Mountains of British Columbia, and possibly crosses their northern extension to the Pacific coast in Alaska; it is the common Spruce of the St. Lawrence valley, extending down the Atlantic coast at least to the shores of Casco Bay, in Maine, and in the interior it finds its southern home on the high mountains of northern New England and New York, northern Michigan, Wisconsin and Minnesota and the Black Hills of Dakota, where, apparently, it is the only Spruce-tree. The White Spruce is occasionally manufactured into lumber in northern New Hampshire and New York, although it is so rare in these regions that it cannot play an important part in the lumber supply; it is more abundant in Maine, and it is the principal timber Spruce in New Brunswick and the maritime provinces; and the wood of this tree is probably the only

Spruce lumber which has floated down the St. Lawrence and reached Europe from Canada.

As an ornamental tree the White Spruce is the best of the whole genus to plant in Canada and our northern states. Its value as an ornamental tree for the north is shown in Prince Edward Island, where rows of this tree have been planted by the roads crossing the island, or have been left standing when the forest-covering made way for tillage. These trees, which are often of great size, are perfect in form and color, with branches which often sweep the ground, and compact pyramidal heads. Cultivated in the northern states, the White Spruce flourishes as far south as southern New England, growing to a large size, retaining its lower branches and its dense habit for many years and displaying great variations of color. Farther south it is affected by heat, and often becomes disfigured by the attacks of red spiders. It is the best of all conifers for northern wind-breaks and hedges, and it is unfortunate that the Norway Spruce and other foreign trees of doubtful value in our climate have been allowed to supersede the White and Red Spruces in northern plantations.

Our illustration on page 355, from a photograph made by Dr. J. T. Rothrock on the Maine coast, gives an idea of the appearance of the White Spruce growing near the southern limits of its range and fully exposed to the fierce blasts of the Atlantic. These stunted wind-swept trees bear, however, little resemblance to the broad cones of verdure which under more favorable conditions the White Spruce raises to the height of more than a hundred feet.

Botanical Gardens.—I.

THE following is a portion of the Vice-Presidential address before the botanical section of the American Association for the Advancement of Science, delivered at Buffalo, New York, August 24th, 1896, by Professor N. L. Britton, the Director of the New York Botanical Garden. The paper will be concluded in our next number.

Origin and Development.—The cultivation of plants within small areas for their healing qualities by the monks of the middle ages appears to have been the beginning of the modern botanical garden, although these mediæval gardens doubtless took their origin from others of greater antiquity. Botanical gardens were thus primarily formed for purely utilitarian objects, although the æsthetic study of planting and of flowers must doubtless have appealed to their owners and visitors. Their function as aids in scientific teaching and research, the one which at present furnishes the dominating reason for their existence, did not develop much, if any, before the sixteenth century, and prior to the middle of the seventeenth century a considerable number existed in Europe, in which this function was recognized to a greater or less degree, of which those at Bologna, Montpelier, Leyden, Paris and Upsala were, perhaps, the most noteworthy. The ornamental and decorative taste for planting had meanwhile been slowly gaining ground, as well as the desire to cultivate rare or unusual species, and during the eighteenth century attained a high degree of development. Many persons of wealth and influence fostered this taste, and became, through the employment of men skilled in botany and horticulture, generous patrons of science. The world was searched for new and rare plants, which were brought home to Europe for cultivation, and many sumptuous volumes, describing and delineating them, were published, mainly through the same patronage. The older gardens were essentially private institutions, but as the rights of the people became more and more recognized the many existing establishments and an increasing number of newly founded ones became, to a greater or less extent, open to the public, either through an admittance fee or without charge. The four main elements of the modern botanical garden have thus been brought into it successively: (1) The utilitarian or economic, (2) the æsthetic, (3) the scientific or biologic, (4) the philanthropic.

These four elements have been given different degrees of prominence, depending mainly upon local conditions, some gardens being essentially æsthetic, some mainly scientific, while in our public parks we find the philanthropic function as the underlying feature, usually accompanied by a touch of the æsthetic and scientific.

The Economic Element.—In the broadest extension of this department of a botanical department there might be included, to advantage, facilities for the display and investigation of all plants directly or indirectly useful to man, and their products. This conception would include forestry, pharmacognosy, agriculture, pomology, pathology and organic chemistry, and, in case the management regards bacteria as plants, bacteriology.

The display of the plants may be effected by growing such of them as will exist without protection in the locality in a plot, more or less individualized, commonly known as the economic garden, while those too tender for cultivation in the open are grown in the greenhouses, either in a separate house or section, or scattered through the several houses or sections, in the temperatures best adapted to their growth. The display of plant products, best accompanied by mounted specimens of the species yielding them, by photographs and by plates, is accomplished by the economic museum, where these are arranged in glass or glass-fronted cases, suitably classified and labeled. It is believed that the most useful results are obtained by arranging this museum by the products themselves, and thus not in biologic sequence, but bringing together all drugs, all fibres, all woods, all resins; where the same product is used in more than one industry, the exhibit may be duplicated, more or less modified, without disadvantage.

The investigation of economic plants and their products is accomplished through the scientific department, and few valuable results can be reached unless the scientific equipment is well developed. The two departments must work conjointly, both on account of the necessity of knowing just what species is under investigation, its structure, distribution and literature, and in order that the most approved and exact methods may be used in the research. Any idea that the scientific element can be dispensed with in connection with economic studies is palpably untenable.

Teaching and research in agriculture, pomology and plant pathology are so well organized in America through our national Department of Agriculture and our numerous agricultural colleges and schools that there is no great necessity for providing elaborate equipments for these branches in botanical gardens. But in case the endowment of a garden were sufficiently large to enable them to be successfully prosecuted, in addition to their more necessary work, there can be no doubt that important additions to knowledge would be obtained. On the other hand, no such liberal allowances have been made with us for forestry or pharmacognosy, and research and instruction in these sciences must prove of the greatest benefit to the country.

The Æsthetic Element.—The buildings, roads, paths and planting of a botanical garden should be constructed and arranged with reference to tasteful and decorative landscape effect. The possibilities of treatment will depend largely upon the topographical character of the area selected and the natural vegetation of the tract. The buildings required are a fireproof structure or structures for museums, herbarium, libraries, laboratories and offices; a glass-house with compartments kept at several different temperatures for exhibition, propagation and experimentation, or several separate glass-houses; and to these will usually be added dwelling-houses for some of the officers, a stable and other minor buildings. The character, number and sizes of the buildings generally depend on financial considerations. In placing the structures intended for the visiting public, considerations of convenient access, satisfactory water-supply, and the distribution of crowds must be borne in mind, in connection with the landscape design. The planting should follow, as nearly as possible, a natural treatment, except immediately around the larger buildings and at the entrances, where considerable formality is desirable for architectural reasons. It is especially desirable that as much natural treatment as possible should be given to the areas devoted to systematic planting—herbaceous grounds, frutecetum, arboretum. The rectilinear arrangement of plant-beds found in most of the older gardens has become abhorrent to landscape lovers, and the sequence of families desired can usually be quite as well obtained by means of curved margined groups.

The cultivation of decorative plants, and especially the fostering of a taste for them, and the bringing of unusual or new species to attention and effecting their general introduction, are important functions of a botanical garden. For the accurate determination of these plants, information concerning their habits and structure, and suggestions regarding the conditions of their growth, the æsthetic side, must rely on the scientific.

The Scientific or Biologic Element.—The important relations of the scientific department to the economic and

æsthetic have already been alluded to. The library, herbarium, museums and laboratories are the sources whence exact information regarding the name, structure, habits, life processes and products of plants are derived, and they are the more useful as they are the more complete and thoroughly equipped. It is practically impossible for any one library to have all the literature of botany and related sciences; any one herbarium to possess an authentic and complete representation of all species of plants; or any one museum to be thoroughly illustrative; absolute perfection along these lines cannot be obtained, but the more closely it is approximated the better the results. The research work of the scientific department should be organized along all lines of botanical inquiry, including taxonomy, morphology, anatomy, physiology and palæontology, and the laboratories should afford ample opportunities and equipment for their successful prosecution.

The arrangement of the areas devoted to systematic planting and the proper labeling of the species grown are important duties of the scientific department. The sequence of classes, orders and families is usually made to follow some "botanical system." It is highly desirable that this should be a system which indicates the natural relations of the families, as understood at the time the garden is laid out, and be elastic enough to admit of subsequent modification, as more exact information relative to these relationships is obtained. The weight of present opinion is overwhelmingly in favor of an arrangement from the more simple to the more complex, and this will apply not only to the systematic plantation, but to the systematic museum and the herbarium.

The scientific possibilities of a botanical garden are the greater if an organic or coöperative relationship exists between it and a university, thus affording ready facilities for information on other sciences.

THE PHILANTHROPIC ELEMENT.—A botanical garden operates as a valuable philanthropic agency, both directly and indirectly. Its direct influence lies through its affording an orderly arranged institution for the instruction, information and recreation of the people, and it is the more efficient for these purposes than a park, as it is the more completely developed and liberally maintained. Its indirect, but equally important, philanthropic operation is through the discovery and dissemination of facts concerning plants and their products, obtained through the studies of the scientific staff and by others using the scientific equipment.

NUMBER AND DISTRIBUTION OF BOTANICAL GARDENS.—There are somewhat over 200 institutions denominated botanical gardens, but only a few of them meet the requirements of the foregoing sketch. Some are essentially pleasure parks, with the plants more or less labeled; most of them pay some attention to taxonomy and morphology; many to economic botany, while a small number are admirably equipped in all branches of the science.

I have drawn freely on Professor Penhallow's first annual report of the Montreal Botanical Garden, published in 1886, for the following approximate statement of the number in different countries:

Algeria, 1; Australia, 3; Austro-Hungary, 13; Belgium, 5; Brazil, 2; Canada, 1; Canary Islands, 1; Cape of Good Hope, 3; Ceylon, 1; Chili, 1; China, 1; Cochin China, 1; Denmark, 2; Ecuador, 1; Egypt 1; France, 22; Germany, 36; Great Britain and Ireland, 12; Greece, 1; Guatemala, 1; Guiana, 1; Holland, 4; India, 7; Italy, 23; Japan, 1; Java, 1; Malta, 1; Mauritius, 1; Natal, 1; New Zealand, 1; Norway, 1; Peru, 1; Philippine Islands, 1; Portugal, 3; Reunion, 1; Roumania, 2; Russia, 16; Servia, 1; Siberia, 1; Spain, 2; Straits Settlements, 1; Sweden, 6; Switzerland, 4; Tasmania, 1; United States, 10; West Indies, 6.

The Sand Dunes of Northern Indiana and their Flora.—I.

THE higher sand dunes by the south-eastern shore of Lake Michigan begin about twenty miles from Chicago and extend to Michigan City, forming a belt from one to three miles wide, which becomes narrower as it sweeps around the shores to the north-east. A spur runs westward from Millers, Indiana, and comes nearly up to the boundary of Illinois, making a narrow belt of sand hills, bordering the north side of the marshy tract through which the Calumet River sluggishly winds. Between this belt and the lake is a region of low sand ridges and sloughs, approximately parallel with the shore and the Calumet, which here drains an area once under the waters of the lake. These ridges rise but a few feet above the lake-level, so that the region is swampy and has a flora differing from that of the higher dunes. The drier areas and narrow ridges form the Pine-barrens proper, in which the Gray Pine prevails.

The dune region is a confused mass of hills and hollows, the deeper depressions being shallow ponds. The features of this region have been shaped by two prevailing wind currents from the north-west and the south-west. The former predominates, and is most active in autumn and winter. Coming across the lake it takes up the sand washed ashore by the waves and drives it in upon the land, so that a severe storm from this quarter on the lake is accompanied by a corresponding storm of sand among the dunes, and the sharp particles are piled in drifts as fantastic in shape as those made by snow. This wind makes the principal ridges generally parallel with the shore. But winds from the west and south-west act upon these moving ridges and throw up others with an axis nearly north and south.

The shifting sands as they are blown along bury lower ridges and fill up hollows lying in their pathway. Their vegetation shares the same fate. Some have been so long undisturbed that Pine-trees thirty inches in diameter are found growing on the ridges. Those from six inches to a foot in diameter are seen on dunes quite near the shore. As some of the highest dunes rise from eighty to a hundred feet above the level of the lake, they are capable of covering trees of considerable height which may be growing in the hollows. This shifting of the sand in large masses is practically confined to a strip scarcely more than half a mile wide along the shore, for the greater part of the hills have been secured by the growth of vegetation. This capturing of the dunes must have begun upon their southern or eastern margin, or the old lake beach, and has worked its way toward the lake till it now holds the greater part of the area once covered by the waters of Lake Michigan when the land at its southern end stood at a lower level, and the discharge was south-westward to the Mississippi. The work went on till in places it has come close to the shore. But in the region of the higher dunes in this belt of shifting sands, though a dune may be captured and held for a long time, there is no permanent security. Where the winds have full sweep near the shore and fresh material is supplied by the sand constantly washed up by the waves, there is a tendency ever to beat back the vegetation. There is a ceaseless struggle between the opposing forces, sometimes one, sometimes the other, prevailing. It is plain to be seen that if the trees were removed from the dunes back from the shore they would in time be blown farther inland and encroach upon the arable ground. A belt of these sand hills, with their covering of vegetation, must be preserved as a screen, or artificial barriers will have to be provided. As they are of little account for tillage they are likely to remain, and however much of the sand may be taken away for filling and grading in swampy areas, the supply is so great and is so continuously renewed that it is practically inexhaustible. The greatest danger comes from fires, but they are guarded against more than formerly, even with the multiplication of railroads as a constant menace. Fortunately, also, the Oak-trees and many of the shrubs have roots or subterranean shoots which the fires do not reach, and they quickly renew themselves if their exposed parts have been destroyed.

The changes to which the dunes have been subjected at some period of their history help to explain one of the peculiar features of their flora and its mixed character. Plants are repeatedly found mingled with those naturally looked for in such localities that contravene our ideas of their adaptations to certain habitats currently accorded them in books, and generally in harmony with experience. Judged by such standards they are out of place. Doubtless some of these plants have a greater flexibility in adapting themselves to changed conditions than is usually granted them, but the principal reason for their presence in such places must be the supply of

those elements favorable to their growth. This becomes evident by the study of the formation of these sand hills. The burying of vegetation provides them with organic matter which more or less pervades them throughout. It is not abundant, but is enough to support the thin growth which covers them. At the time of the falling of the leaves in autumn or early winter we have a special lesson showing how vegetable matter is caught and preserved. Every bunch of grass or weed of any kind which the less active winds of summer have allowed to grow becomes a lodging place for leaves moving about with every breeze, and is soon surrounded by a ring of them. They are quickly loaded down by the shifting sand, to be buried with the plants which have caught them, or carried elsewhere along with the uprooted plants. This process annually repeated adds to the vegetable matter of the dunes, and sands which to the eye seem so purely silicious have more or less plant-food diffused among them. Where the vegetation has been undisturbed for a long time and the surface is well protected, a layer of vegetable mold two or three inches deep, mixed with some sand, accumulates, especially on the sheltered slopes and in the hollows. When such areas are near the shore they may be assailed by the wind and carried away, or the mold may be buried more or less deeply by the sand sifted in among the trees.

Nor are the dunes as devoid of moisture as would naturally be inferred. Their bases are saturated with water from the lake or from neighboring sloughs, and an unfailing supply is obtained for wells driven six or eight feet into the ground at this low level. This water comes to the surface of the hills by capillary action, and by digging down a foot or two the sand feels cool and moist. The roots of the plants not only run deep, but they are very finely divided and offer many points of contact with the soil. When the wind in destroying a dune exposes a section of its surface these roots are found to pervade the sand with a close, fine network, and are left as a dense fringe hanging from its upper edge. Some may be traced seven or eight feet vertically, though the stem of the plant itself rises but a foot or two above the surface of the ground. Some run a long distance horizontally. Those of Artemisia may be traced five feet or more in this way, though they become almost hair-like in diameter soon after leaving the main root. When the surface of the ground in places exposed to the direct rays of the sun becomes very warm the heat does not penetrate deeply, for much of it is reflected from the smooth surfaces of the particles of sand. Hence it is not common on the dunes to see plants drooping and withering even in quite dry weather. The earlier annual plants which have less depth of root are most likely to be affected. The supply of moisture from the base of the hills and from the vapors of the lake goes far toward counteracting droughts, so that in this respect the vegetation of the dunes is more favorably situated than that often growing on richer soil.

Chicago, Ill. *E. J. Hill.*

Foreign Correspondence.

London Letter.

Cattleya Hardyana.—This supposed natural hybrid between Cattleya gigas and C. aurea first flowered in England about ten years ago, when it was imported with C. gigas. It was named and figured by B. S. Williams in his *Orchid Album*, v., t. 231. It is by far the most beautiful of all the Cattleyas of the labiata group, and, notwithstanding a considerable range of variation revealed in the plants of it flowered in European collections, it continues to be one of the most highly prized, and, I might add, highly priced, of garden Orchids. The most beautiful form of it yet seen was sent to the last meeting of the Royal Horticultural Society by Baron Schroëder under the name of Clarke's variety, and was awarded a first-class certificate. The flowers are large, of a lustrous rose-purple color, the well-formed spreading lip rich maroon in front, crimson in the throat, with deep yellow reticulating veins. A flower of an ordinary variety of C. Hardyana was shown with it for purposes of comparison. C. gigas is one of the noblest of Cattleyas, its only fault being a shy flowering nature. The form called Sanderiana or imperialis is the freest, and some of the latter so nearly resemble C. Hardyana that one feels disposed to look upon the latter as a sport simply from C. gigas.

Spathoglottis plicata.—There are now three well-marked varieties of this Malayan ground-Orchid in cultivation, namely, the type which has leaves two feet or more long, a scape about a yard high bearing a short raceme of about a dozen flowers each an inch or so in diameter, the sepals and petals rose-purple and the long-clawed lip paler, with a yellow crest. The second is the white-flowered form called alba, of which the only plant I know is in the Kew collection. This differs from the first-named in having flowers with white segments and a yellow blotch on the lip. The third is a new introduction recently flowered in Messrs. Sander & Co.'s nursery at St. Albans. This is remarkable in having smaller leaves, a scape only a foot long and flowers half as large again as those of the type. It is named Spathoglottis plicata, var. Micholitzii, in compliment to the collector who found it in Perak. These plants grow best when suspended near the roof glass in a hot moist house, their pseudo-bulbs nestling in a light sandy compost and surrounded by sphagnum, which should be kept saturated all through the growing season. S. aurea, S. Kimballiana and S. Wragi, all first-rate East Indian Orchids, thrive under the same treatment.

New Hybrid Orchids.—Among the new plants exhibited this week at the meeting of the Royal Horticultural Society the following hybrids deserve special mention: Cypripedium Excelsior, var. Mars, raised by Messrs. Sander & Co. from C. Rothschildianum and C. Harrisianum. It has a white dorsal sepal with purple lines, the petals drooping, greenish, with numerous black-purple spots and the pouch dark purple mixed with rosy lilac. Lælio-Cattleya Seraph, raised by Mr. C. L. Ingram, of Godalming, from L. elegans and C. citrina. It has short fusiform pseudo-bulbs, erect scapes and medium-sized flowers with spreading greenish yellow sepals and petals and a white and purple lip. The characters of C. citrina are not apparent in the hybrid. Cattleya Marriottiana, from Sir William Marriott, and said to be the result of a cross between C. gigas and C. Eldorado, does not differ appreciably from the last-named except in having smaller flowers. This cross would appear to be interesting as a case of reduction in size in all the vegetative characters of the two parents, an unusual occurrence in plant hybridization.

Hardy Bamboos.—A comprehensive collection of these plants from the nursery of Messrs. J. Veitch & Sons formed a special feature at the last meeting of the Royal Horticultural Society. This enterprising firm has not been slow to work up a stock of hardy Bamboos to meet the demand for them consequent upon the success of the experiments in their cultivation in the open air at Kew and the various books, papers and lectures specially devoted to them. Some of the species were awarded first-class certificates, notably Bambusa palmata and B. Kumasaca, two of the most distinct and attractive, the former being remarkable for the large size, thickness and rich green color of its evergreen leaves, borne on stems three to five feet high; the latter for its elegant habit, the stems being perfectly erect, two or three feet high, branched below and bearing ovate dark green leaves quite distinct in pose and outline from all other hardy Bamboos. The growth made by these plants this year under the influence of exceptional sunshine and heat has far surpassed anything done in previous seasons. The collection at Kew is now looking magnificent. It is difficult to overrate hardy Bamboos as effective shrubs for open-air gardening.

Phloxes.—The herbaceous border or isolated bed on the lawn are beautiful at this season of the year with forms of Phlox suffruticosa, the parent of the popular garden Phlox.

Considerable improvement both in habit of growth and size and color of flowers has been made recently by breeders of Phloxes, the difference in these characters of newer sorts, compared with the old ones, being most marked. No floral picture in the open air surpasses a bed filled with the best varieties of Phlox, and no picture is more easily made. The plants are supplied small in pots for a few pence each in spring by Dobbie & Co., Rothesay; Lemoine, of Nancy, and other nurserymen who make a specialty of them, and these, if planted in well-manured soil in a sunny position, grow rapidly and flower freely the first year. The stems should be staked early, otherwise they are apt to be twisted off by wind; they must also be watched against mice, which are fond of nibbling the bark off all round the base of the stems and so destroying them. The plants are at their best the second or third year after planting. A bed filled with one good variety, such as Ætna or Coquelicot (flame-red), or Sylphide or Lawrence (pure white), or Carillon or Toreador (beautiful clear pink), is most pleasing in effect and makes a display during the greater part of the summer.

COCKSCOMB CELOSIA.—Mr. Cannell, of the Swanley nurseries, has faith in old favorites, no nurserymen in England doing so much to keep them before the public or to revive a taste for them, should they have gone out of favor, as he. When Verbenas were neglected Mr. Cannell took them in hand and soon brought them into favor by means of wonderful exhibitions of their flowers at almost all times of the year. He has done equally valuable work with Zonal Pelargoniums, Primulas, Coleuses, Cannas, Dahlias and Begonias. Recently he has paid particular attention to Cockscombs, and his exhibition of them at the late meeting of the Royal Horticultural Society will, no doubt, cause many horticulturists to devote a frame or two to the cultivation of these most extraordinary plants. Grown in five-inch pots, with stems less than six inches high and combs nine inches by four inches, colored almost every shade from white to deep crimson, Cockscombs are decidedly decorative as well as interesting. The feathered form of this Celosia, sometimes called Pyramidalis, is equally useful. In the London parks it is used as a bedding-plant, and at Kew it is one of the most effective plants in the conservatory in July and August.

London. *W. Watson.*

Fig. 47.—The White Spruce (Picea alba) on the Maine Coast.—See page 351.

Cultural Department.

The Osage Cantaloupe.

THIS is a product of accidental hybridization between the Banana Cantaloupe and the Jenny Lind, or one of the numerous netted Melons. Several hybrids of the Banana Melon have been produced; some like the Osage, others quite different. The Osage is a green Melon, with salmon-red flesh, a small cavity, a strong perfume; is in some cases markedly ribbed, in others nearly smooth, and in others netted. Before it ripens it has an odor, and when it is ripe the peculiar characteristic perfume, like that of the Banana Melon, will fill a room. When fully ripe the flower-end becomes soft and is greenish yellow, and the same color prevails at the bottom of the grooves when decidedly ribbed. At the flower-end is the peculiar discoid mark so common in several well-known netted Melons. The flavor is excellent and closely resembles that of the Banana Cantaloupe when grown under favorable circumstances of soil, climate and season.

The Banana Cantaloupe is not a curiosity simply when well grown, but it so seldom is well-grown that it has been allowed to run out. Fruits of this variety have been produced which were three feet long and weighed seventeen pounds. I had one two feet long that produced an ounce of seeds and had no open cavity. A cross-section showed three narrow V-shaped fissures running through it, united at the central ends, and containing the seeds. The flavor was pronounced first-class.

The origin of the Osage was detected in the peculiar odor of the Melon, in its yellow ground-spot, in its yellow seeds, in its flavor and in its red flesh. One fruit showed its origin, as it presented the Banana Melon on the lower half, and the netted Melon on its upper. This hybrid is only partly settled as a distinctive variety, and still has a disposition to run into one or the other parent. The interior seems to be settled, but the exterior varies. In form it is round or oval, and weighs from four to eight pounds. Green Melons and red-fleshed ones are not popular. Netted and green-fleshed fruits are most so. The Jenny Lind Melon was called the "Centre Melon" sixty years ago, when the great Swedish singer was a little girl. It came from Asia Minor, and has been grown from half a pound to four pounds in weight. The highest bouquet is in the smallest fruits of a green interior.

My attention has been particularly directed to the Osage Melon of late because this is a bad Melon year, and the only good ones I have had have been of the Osage variety. I think the experiment of hybridization between the Osage and Jenny Lind, or Netted Gem, worth trying.

Philadelphia, Pa. *R. P. Harris.*

The Chinese Hibiscus as a Lawn Plant.

HIBISCUS ROSA-SINENSIS and its many beautiful varieties have been utilized about the grounds of the executive mansion this year with fine effect. At the west end of the mansion, near the State, War and Navy Buildings, there are large groups of them associated with Japanese Maples and Bamboos. The Hibiscus plants are kept dormant all through the winter; if kept dry in the fall they lose their leaves during the winter months and they are easily carried over in a structure the temperature of which is just high enough to keep out the frost. In the spring, if it is necessary, the plants are shifted into larger tubs or pots and simply plunged in the ground where it is intended they should remain during the summer; this is a much better way to treat old plants, for when they are planted out they make too much growth at the expense of a rich display of flowers, but when young plants are wanted to grow rapidly into specimens they make very quick progress when they have unlimited root room. The best time to propagate is in the fall after the new wood is ripe; take the ends of the shoots from four to six inches in length for the cuttings, after they are well rooted, pot in three-inch pots, shift into fives in the spring, say about the beginning of May, plunge in an open frame; by the beginning of August they will be ready for a shift into eight or ten inch pots, and the growth they will make before cold weather sets in will bring them to a height of about three feet, with nice bushy heads. The following summer they will make very ornamental plants for the lawn or for planting in beds.

There are numerous varieties, differing from each other chiefly in the color of the flowers. The double-flowered kinds are not so free-flowering, neither are they as strong-growing as the single-flowering varieties; the individual flowers, however, last a much longer time in bloom than the single ones. The variety grandiflorus has a fine bold light crimson flower, and is a free bloomer. The under surfaces of the petals are much lighter in color; on one side they are marbled with a creamy white color. The leaves are small, sometimes deeply cut and toothed. Brilliantissimus has quite large heart-shaped leaves, very regularly toothed; the flowers are of a brilliant crimson, the under surfaces being very little lighter, shining near the base. The petals after the first day or so are a trifle reflexed; this is the best of the single varieties. The variety rubra plena has very double flowers, the outer petals reflexed to such an extent as to form a ball; in color it is intermediate between grandiflorus and brilliantissimus. Lucien Linden has double flowers, but they are small and badly shaped, the color yellowish white and pale crimson, the latter color predominating. Calleri has double, buff-yellow flowers, probably the easiest to manage of the doubles. Luteolus plenus has light yellow flowers; the bases of the petals are deep scarlet. There are numerous other forms, but those given above are the most distinct.

Botanic Garden, Washington, D. C. *G. W. Oliver.*

Water-lilies and Extreme Heat.

EUROPEANS who have noticed the good qualities of Nymphæas that have been enhanced by the almost tropical weather experienced this season, are better able to judge of our superior advantages under which we can cultivate all varieties of Nymphæas, especially the tropical varieties, as well as the different varieties of Nelumbiums in the open air. What Mr. W. Watson says of the new forms of red hardy Nymphæas (page 334), that they improve under extreme heat, is equally true in the United States, only more so, but this does not hold good of other forms of red or pink Water-lilies. During the past heated term Nymphæa Marliacea rosea and N. Marliacea carnea depreciated very much in size and color, the flowers of the former not being so good as those of the latter in its best form, and produced very sparingly. The same remarks apply to our native pink forms of Water-lilies, N. odorata rosea, and Caroliniana and exquisita, as well as N. tuberosa rosea; the flowers were smaller, lighter in color and the sepals occasionally sunburnt, consequently the flowers were somewhat deformed. Marliac's Chromatella and N. odorata sulphurea depreciated only in size; the color was extremely rich. All varieties of hardy white Water-lilies decreased in size and quantity of bloom likewise. It is cheering to note the marked difference with all the above-mentioned Lilies after a week of normal weather. The pink varieties have improved in color, and all are improving in size and quantity of flowers. An exception must be made with N. odorata rosea; this may be attributed to the crop of seed just ripening, as it produces seed freely, and while a plant is bearing a crop of fruit it can hardly be expected to continue its production of choice flowers at the same time. The tropical weather experienced here early in August had a marked effect on all the tender Nymphæas; they grew luxuriantly and produced most charming flowers of more intense coloring than I have noticed before, nor did they lack in size or numbers. Victoria regia made remarkable growth, producing three leaves and four flowers in seven days. Nelumbiums also made remarkable growth and flowers.

Though we do not always experience so long a heated term so that the temperature of the water rises to one hundred degrees, yet, as a rule, our summers are hot, and during the height of the season the hardy varieties of Water-lilies deteriorate more or less according to location. The fact is patent, that the tender varieties are well adapted to our summer seasons and are indispensable for water gardens. They are as easy of culture as any of the hardy kinds, grow more luxuriantly, flower profusely, do not suffer through extreme heat and continue to blossom until cut down by frost. The color of the flowers is not equaled by the hardy varieties, and another point in their favor is that they are within the reach of all, as they can be purchased at a very low price compared with some of the hardy kinds.

Riverton, N. J. *Wm. Tricker.*

Ornamental Grasses.

THE value of Arundos, Miscanthus (Eulalias) and Erianthus as decorative plants in the garden, and of their plumes for cutting, is well known; but aside from these there are a number of annual and dwarfer perennial kinds whose flowers are particularly graceful and useful, either in making bouquets of themselves, or in giving to other flowers that lightness and gracefulness so necessary to well-arranged vases of flowers.

We reserve one border entirely for them, and have this

year some twenty-five species. We sow the seeds the second week in April rather thickly in four-inch pots placed on a gentle hot-bed. The seed germinates in a few days, and by the time the weather is fit for planting out the Grasses will be about two inches high. We then split up each species into eight or more little clumps, and plant them about ten inches apart so that each species forms a small square. I find this way of raising Grasses far more reliable and easier than sowing the seed in the open border. A collection of these Grasses may be obtained from any reliable seedsman.

Of the species which have flowered in our border thus far this season I find the following to be of especial value:

Agrostis nebulosa, an annual growing about eighteen inches high, with panicles of extreme fineness; in fact, one could hardly imagine anything more delicate and airy. It is commonly called "Cloud Grass." Nicholson's *Dictionary of Gardening* describes this species as "panicles resemble, when developed, a cloud resting over the ground." Bromus brizæformis, an elegant species growing about two feet high, with panicles of drooping spikelets, each spikelet measuring three-quarters of an inch long by half an inch wide. Briza gracilis, a low-growing Grass with panicles of small triangular spikelets. This species is commonly called the "Little Quaking Grass." Coix Lachryma, growing to a height of three feet. The flowers are borne in axillary pendulous racemes, and are more curious, perhaps, than pretty, but the leaves, which are one foot long by one inch wide, are particularly graceful. The seeds of this species are large and round, very unlike Grass seeds in general. The common name of this species is "Job's Tears." Phalaris paradoxa, an annual growing about two feet high, with flowers arranged in a close spike resembling the Fox-tail Grass. Paspalum elegans, a beautiful species growing about three feet high. The flowers are in close terminal panicles and are of a beautiful silvery gray color. The leaves are about four inches long by one wide. Panicum virgatum, a perennial species, about four feet high, with very large terminal panicles of flowers of a reddish brown color. The leaves are from one to two feet long by half an inch wide. Avena sterilis, growing about three feet in height. The flowers are in large spikelets, arranged in drooping panicles, and are very handsome. The common name of this species is "Animated Oats." It is an annual and a native of Barbary. Pennisetum longistylum, no doubt the best of all the spike-flowered Grasses. The spikes are some five inches long, and the long styles make them very beautiful. It grows about three feet high and the leaves are long and narrow.

Botanic Garden, Northampton, Mass. *Edward J. Canning.*

Fancy-leaved Caladiums.—The collection of these plants at the nurseries of John Saul fills three good-sized houses. The number of kinds grown is somewhere in the neighborhood of three hundred; most of the varieties have been imported directly from Brazil; many of them are very distinct. While most of them are highly colored, slow to grow and increase, there are a great many kinds which make splendid specimen plants for the greenhouse, and there are quite a number useful for the decoration of the summer garden. Those kinds which, from their appearance, are likely to be of use for summer planting out-of-doors are carefully tested in the open ground; one of the best for this purpose is named Cataguazes. When full grown it is about three feet high, the leaves are green on the outer edges, the centres are white and spotted all over with large pinkish white blotches. Pentado has greenish yellow leaves spotted thickly with pink and white; this variety is only good for the greenhouse; it is slow-growing, but very showy. Baron de Mamore has blood-red veins, the remaining part of the leaf being thickly mottled with white; a splendid variety either for pot-culture or for bedding out. Carolina has leaves light green at the margins, pink centre bordered with white; good for pot-culture only. J. C. Schmidt has dark metallic foliage; the principal veins are deep pink. Capivari has green leaves blotched with white and pink; good for outdoors. Jurana has heart-shaped leaves with green margins, bright pink centres, but is of no use outside. E. G. Henderson is a variety with an uneven leaf-surface, pink veins and pink blotches on a green ground; a very good bedder. Luddemannii has pink centre, green, blotched with white; good out-of-doors. Diana is after the style of the well-known Triomphe de l'Exposition, the foliage being somewhat paler than that grand variety. Candidum is probably the best of the light-colored ones. In Baron de Rothschild the principal veins are very deep red, with the same color in blotches all over the leaf; it is one of the best kinds for pot-work. It is found to be a trifle more difficult to keep those highly colored kinds over winter than it is to keep the more robust sorts; the safest way is to put the tubers either in dry sand or sawdust and keep in a warm dry place.

Botanic Garden, Washington, D. C. *G. W. O.*

Correspondence.

To Protect the Beauty of the Woods.

To the Editor of GARDEN AND FOREST:

Sir,—It may not be generally realized that scientific forestry, though of inestimable value to a growing country, may in time despoil the woodland scenery of much of its highest charm. If this is so, what is the remedy? It seems to me that it might be desirable to include in the prospective managing boards of our forest interests, whether state or national, some person or persons whose influence should count for the æsthetic value of our forests. In such a staff of directors, for instance, as was proposed by Mr. Judson N. Cross, of Minneapolis, in his scheme for restoring and preserving the Minnesota woods (see page 181), might it not be proper under these conditions to include some authority on art—somebody with a recognized understanding and appreciation of the beautiful in Nature?

When I say that scientific forestry tends to mar the beauty of woodland scenery, I refer to the changes in outward appearance that natural forests undergo as a result of some of the methods prescribed by scientific forestry. On the whole, such forests in time assume a strikingly artificial look. They show the evidence of man's handling and interference for some purpose. The trees, where planted or systematically sown, stand in monotonous rows or squares. The transition from undergrowth to standing forest is often abrupt and unpleasant. Again, there is not infrequently a systematic lopping of the lower branches, through which the crowns of the trees are raised to an awkward and unnatural height. At a distance the artificiality of such woods is still more obtrusive. They are apt to look patched and pieced together, incongruous in outline and form of surface and discordant in combination of color. An irregular stripe of young Beeches, for instance, may be followed by a patch of full-grown Pines, and this in turn by a bare spot ready for an aftergrowth. As a rule, there is wanting that graceful outline, soft blending of shades and fitness in detail that Nature, left to herself, so well knows how to produce.

In detailing these effects of scientific forestry I have only tried to show that scientific forestry methods do, in fact, influence undesirably the outward appearance of forests. The effects I have spoken of are mostly the results of important principles of forestry and cannot be sweepingly removed. And yet something may, perhaps, be done to mitigate their effect. It is plain, of course, that, on the whole, forestry must be allowed free scope. It should be remembered, however, that forestry is an art as well as a science, and that, according to the conditions of soil, climate, and so forth, cases may arise where one method would serve nearly as well as another. If in some way the primeval aspect of a characteristic bit of scenery might be preserved without seriously departing from the main principles of the best forest practice, might not such a departure be justified? I have in mind a part of the woods belonging to the city of Stuttgart, Wuerttemberg, which lie several miles from the city on a hill. In this case an order was given several years ago that these woods should at no time be cleared, like the surrounding forest, but that reforestation should be effected through natural seeding or planting under, in order that the dense beauty of the green forest might stand uninterruptedly an agreeable sight to the citizens. We may, perhaps, assume, or, at least, hope, that our system of forest management will be more pliable and elastic than forestry systems of European countries, because our civil institutions are less rigid and bureaucratic than theirs; which leads me to believe that instances like the one I have cited might with us be made of still wider application. It is even conceivable that special cases might arise where the exceptional beauty of the landscape might warrant an entire subordination to it of the question of material gain aimed at by forestry.

Aside from this, the critic I have proposed could exercise his powers in certain other specific ways. He could, for instance, select exceptionally beautiful or otherwise remarkable individual trees for special protection and preservation. It occurs to me that the selection of wooded areas for "County Parks," as they were described in your editorial article for June 3d, might likewise be entrusted to his care.

In this way it would be possible to retain something of the

pristine beauty of our scenery, and some of the best influences of Nature, so constantly threatened in various ways by "progress and civilization," might be preserved.

Nuenden, Germany. *G. F. Schwarz.*

The Massing of Wild Flowers.

To the Editor of Garden and Forest:

Sir,—Public parks and extensive private grounds have more to do in moulding public opinion in horticultural matters than all the learned works of floriculturists or landscape-gardeners. Theirs is an illustration that he who runs may read. Their mistakes and their successes are patterned after on every hand. Because of this it is a pleasure to note that those with roomy grounds are beginning to look to our native shrubs, vines and flowers for a part of their planting.

As yet there is one fault to be found with nearly all of these trials. They rarely show the breadth and plenitude of Nature at her best. There is a narrowness of scope, a paucity of effect, the more noticeable that it is in direct conflict with the teachings of Nature. It is true that around our villages and in long-settled portions of our country desirable native plants are scattered, and found mostly as single specimens. How could it be otherwise when efforts to exterminate them have been going on for years unchecked? But away from the homes of men and the haunts of cattle the scene is changed. Dame Nature scorns the puny achievements of the modern gardener. Look over the unbroken expanse of a wild prairie in June and July, and you will see acres upon acres, one vast sea of flowers. I have myself seen on a western plain hundreds of acres, one waving sea of Phlox in billows of white, mauve, pink and crimson, dashed with the flame of thousands of wild red Lilies. The finest park can show nothing as grand or as impressive.

While such a display of this is beyond the power of man to obtain, there are numberless other examples of Nature's uses of wild flowers that may readily be adapted to extensive pleasure-grounds. A low strip of ground, perhaps a quarter of an acre, completely carpeted with sky-blue Houstonia cœrulea, is one such object-lesson; a tiny rivulet flowing between banks thickly fringed with Lobelia cardinalis and L. syphilitica in vivid spikes of scarlet and blue, is another, and a solid mass of Cypripedium spectabile filling a little wooded dell with rank, lush growth, a hundred of its royal banner-like blooms in flower at one time, is yet another example of Nature's lavish massing.

It is not a difficult matter to secure these wild-flower carpetings. First choose a judicious location and favorable soil, then dot here and there plants such as you wish to occupy the ground. Let them seed and spread after their own fashion, and in a few years they will have taken complete possession of the plot. Here at Oak Lawn we have found, to our cost, that some wild flowers will not only fulfill this mission of carpet-bedding, but will invade the regular precincts of the formal flower garden if not persistently weeded out. Conoclinium cœlestinum and Verbena aubletia are especial nuisances, the wind taking their light seeds and carrying them here, there and everywhere. Sabbatias, native Irises, Agaves, Phloxes, Violets and Dodecatheons are more satisfactory, forming well-defined clumps or masses, but not spreading beyond bounds.

Pineville, Mo. *Lora S La Mance.*

Notes from Germantown, Pennsylvania.

To the Editor of Garden and Forest:

Sir,—Few shrubs make a handsomer display in late August than the chaste tree Vitex Agnus-castus. There are three varieties with white, blue and lilac-purple flowers, respectively, borne on spikes about six inches long, produced on the ends of shoots of the present season's growth. The scarcity of shrubs with blue flowers makes the variety of this color most desirable, perhaps. This shrub gets partly winter-killed with us, but this does not hurt it in the slightest. On the contrary, the shoots seem to start more vigorously from the base and give finer flowers than they otherwise would. Where it does not partly winter-kill it would be best to prune it back well in spring, as is done with Hydrangea paniculata grandiflora. There is a species from northern China, Vitex incisa, which is said to be hardy in New England.

The pink cones on many Magnolias are both interesting and beautiful at this season of the year. M. tripetala makes the best display of any species, the pods being of good size and rosy pink in color. The Japanese M. hypoleuca has larger pods, being six inches in length on small trees, but the color is not as bright as those on our native tree. Magnolias are worth planting for the beauty of their fruit alone, for certainly at this season of the year no trees are more ornamental than these.

The Crape Myrtle, Lagerstrœmia Indica, though its tops get winter-killed here in severe winters while the plant is young, is able to withstand the cold when well established. The common pink one is now in bloom about Germantown, and the specimens draw the attention of every passer-by. The varieties with white and with crimson flowers seem quite as hardy.

Germantown, Pa. *Joseph Meehan.*

The Forest.

The Burma Teak Forests.—V.

Revenue derived from other kinds of timber.

THE removal of these obstructions placed at my disposal a large extent of good Teak localities that had never been touched by the axe of the lumberman, and fortunately the existence of this wealth of growing timber was unknown to my friends, the merchants of Rangoon.

It has already been stated that up to 1879-80 nearly the whole surplus revenue was derived from the sale of Teak timber. In 1860, however, as soon as the financial success of forest administration in these provinces had been secured, large quantities of other woods, not teak, sound, carefully selected pieces of those kinds which were likely to prove useful, were brought down from the forests to Rangoon. At the monthly sales these timbers were sold at the Government timber depot with the view of bringing other kinds of timber to public notice. At that time these operations yielded no profit, nor was this anticipated. They cost a good deal of money, but the object I had in view was attained. A demand gradually sprang up for several kinds, and among others one kind, Pentace Burmanica, a Tiliaceous tree, formerly quite unknown to trade, was discovered to be useful for tea boxes and furniture. After I had left Burma in 1862 these operations were discontinued for some time; they were, however, afterward resumed and yielded a small surplus of 30,000 rupees a year on an average during the three years ending with 1878-9.

As population increased in Burma, and as cultivation extended, the trade in other kinds of timber and bamboos increased considerably. Outside the demarcated reserves the cutting of other trees, not Teak, is and always has been free for the extension of cultivation as well as for the domestic and agricultural requirements of the people residing within a certain distance, usually five miles from the forests. Timber and bamboos exported for trade, or used for the manufacture of cutch (the extract of the heart-wood of Acacia Catechu, an excellent material for tanning), are paid for at fixed rates. From the demarcated reserves bamboos and timber of other kinds are exported under special arrangements. But, as already mentioned, the total revenue derived from bamboos and woods of other kinds forms a small proportion only of the total surplus forest revenue.

Yield of timber and revenue.

The result of working the forests of lower Burma, under the system commenced in 1856, will be better understood by a glance at the following figures, exhibiting for five unequal periods, during the thirty-eight years from 1856 to 1893, the number of trees girdled, the timber extracted from the forests and the net revenue realized. In 1886 the kingdom of upper Burma was annexed to the British Indian Empire. The present figures relate to lower Burma only, that is to those provinces which in 1856 were known as Pegu, Martaban and Tenasserim, and which, with Arakan, were until 1886 known under the designation of British Burma:

Periods.	Trees girdled annually.	Timber extracted annually. 1 ton = 50 cub. ft.	Annual net revenue. Rupees.
12 years, '56–'57 to '67–'68,	24,300	25,200	208,000
11 " '68–'69 " '78–'79,	7,900	45,400	542,900
10 " '79–'80 " '88–'89,	18,000	38,700	945,000
5 " '89–'90 " '93–'94,	20,300	68,000	1,870,000

The system of girdling the trees several years before they are cut has this effect, that the girdled timber constitutes, as it were, a store which is drawn upon gradually at the convenience of the persons employed in extracting the timber. Thus, a large proportion of the timber girdled during the first period of twelve years was not brought to market until many years later, and served to swell the out-turn of the second period. Again, the diminished girdlings during the second period took effect in diminishing the timber extracted during the third

period. Apart from this temporary decrease, the annual yield of the forests in timber has risen steadily, and, as already stated, the net revenue has increased largely, and this was mainly due to the increased quantity, and the improved quality of the timber brought from the forests and to the rise in the selling rates of Teak timber.

At the outset too favorable a view was taken of the rate of growth of the Teak-tree, hence the large mean annual girdlings of the first period. In 1868 we erred in the opposite direction, hence the small number girdled during the second period. The total number of trees girdled during the thirty-eight years in question was, as already stated, 660,000, or at the rate of 17,400 a year. To the present time special working plans have been prepared for eleven forest districts in the Iraauddi and two in the Sitang valley, aggregating 865,260 acres. For this area (thirteen districts) the number of trees to be girdled annually has been fixed by these working plans at 13,680, or fifteen trees on 1,000 acres. The aggregate area of reserved forests in lower Burma in 1894 amounted to four million acres. A portion of this area has been reserved for the sake of other valuable trees, chiefly Acacia Catechu. The annual yield of the Teak localities, when special working plans shall have been prepared for all, may safely be estimated at 40,000 trees a year. It is most satisfactory that, although in 1856 much too rapid a rate of growth was assumed, nevertheless the girdlings during the first period were considerably below what may be regarded as the probable normal yield of these forests. It is, however, possible that the full number stated in the returns—upon which the figures here given are based—was not girdled. In those districts where the work was carried on in 1857 and 1858 no competent officers were available to superintend the work.

The aggregate net revenue which these forests have produced during the thirty-eight years in question has amounted to 27,240,000 rupees. During the first two periods, until 1879, the rupee was worth on an average two shillings, but, owing to the depreciation of silver, its value has since diminished steadily, until during the five years of the last period it averaged fourteen pence. Expressed in gold, the aggregate net revenue from these forests during this period of thirty-eight years has amounted to £2,093,000. During the five years ending with 1894 the mean annual surplus revenue has amounted to £109,080, or $545,400. On an area of four million acres this amounts to sixpence an acre, a rent with which no forest proprietor in the United States would be satisfied. But it must be remembered that Teak and Acacia catechu, at present practically the only marketable trees, form less than one-tenth part of the whole growing stock, and, what is more important, that all the easily accessible portions of the forest had previously been cleared out, and that a large portion of the annual expenditure is devoted to the improvement of the forests by planting and otherwise.

The disastrous consequences which in 1860 the merchants of Rangoon predicted would inevitably follow if the system initiated in 1856 were persevered in, have not taken place; the use of iron has increased all over the world, and yet Teak timber is not a drug in the market; its price has risen steadily. It has chiefly been the wonderful development of the British Indian Empire since that time which has thus increased the demand for Teak timber. The millions inhabiting that empire are prosperous, teak is the best timber in a tropical climate, hence the export of this article from Burma to other parts of the Indian Empire has increased largely. A portion only, however, of this timber is the produce of the forests in lower Burma. Those of upper Burma and of that portion of Siam which is situated within the catchment area of the Salween River also yield large quantities. At the commencement of the period of thirty-eight years here adverted to, the quantity exported annually from Rangoon and Moulmein amounted to 86,000 tons. During the five years ending 1893-4 it has averaged 182,000 tons. This shows the increase in the demand for Teak timber during that period.

Bonn, Germany. *Dietrich Brandis.*

Recent Publications.

Familiar Trees and their Leaves. Described and illustrated by F. Schuyler Mathews. New York: D. Appleton & Co.

This book, with its attractive cover and well-printed pages and illustrations, is another effort in a popular style to help those who have but little botanical knowledge to identify the different trees encountered by the roadside or in the forest. In a brief introduction Professor Bailey says: "There are two ways of knowing trees: one is the way of human feeling and sympathy through which a tree becomes a part of one's self as the sunshine does and is identified with every hallowed experience. Another way is the botanical or analytical way which scrutinizes every detail, is essential to truth but not to feeling, and is so likely to restrict and dwarf the vision and the sympathies as to make the tree but a laboratory filled with curiously fashioned mechanism." All this may be true, but we never chanced to meet with a man whose appreciation of the beauty or poetic charm of a tree was dulled because he knew so much about it. We have never yet been acquainted with an astronomer whose scientific attainments prevented him from feeling the sublimity of the starry heavens, nor with a geologist to whom the landscape was less lovely because he was familiar with the history of its rocks and knew the laws of the great forces which had moulded its surfaces. It is certainly true, however, that many persons who would like to know something about trees have neither the time nor the inclination to take up the systematic study of botany; and yet a book whose direct purpose is to help beginners to distinguish one tree from another by means of their leaves will be of little use unless it describes these leaves accurately and compares them so as to bring out their resemblances and differences. If this is done correctly it is science, and true descriptive science as far as it goes. There can be no question as to the usefulness of a book which leads the beginner to examine and compare the leaves and barks and fruits of trees for the purpose of identifying them, for these features can be seen at almost any time of the year, and unless one knows them familiarly and thoroughly he never can become acquainted with the different species. If trees are taken up as part of a course of botanical study, with shrubs, herbs, grasses, etc., their flowers or reproductive organs are likely to be the leading characters investigated. These are often minute, hard to secure, and they usually remain but a few days. It is, therefore, much more natural for one who simply wishes to learn how to recognize trees to use a manual in which the leaves are the features mainly relied on for determining them. To serve this purpose Professor Apgar has already prepared an admirable little manual, entitled *The Trees of the Northern United States*, and by the help of a key and drawings of the leaves it is quite easy for any one to make sure of the name of any tree of which he has secured a specimen branch. This book of Mr. Mathews is a good one, too, because in the main the drawings are accurate and the statements are clear and true, which means that it is good botany. It would have been more helpful if it had been more systematic—that is, more scientific. In preparing a manual to enable students to distinguish the leaf of a Willow from the leaf of an Oak or any other tree, there can be no better way than to make a drawing of a leaf which is as nearly typical as may be, and then give a description in the old-fashioned way. This Mr. Mathews has done fairly well.

The drawings would have been more useful if the scale as compared with the natural size of the leaf had been given in each instance. They are usually spirited and accurate, but since Mr. Mathews tells us that he draws any leaf which he may come across, whether typical or not, he frequently draws those like the Crab-apple, on page 60, which are not of the usual form. The serrate, heart-shaped leaves of our Lindens are distinctly oblique at the base, but this last character is not shown at all, while the unlobed form of the Mulberry-leaf shows an inequality which it does not have. The strong, curved, parallel ribs are striking characteristics of all our Dogwoods, which the drawings fail to emphasize. Perhaps Butternut-leaves with nine leaflets can be found, but they almost never have so few, and the double buds of these trees are usually so conspicuous that when the twig on which the leaf appears is added this character might well have been introduced. We have also observed occasional inaccuracies in the descriptions and a few obscure and erroneous statements, but

in the main the book is a trustworthy guide. It will serve a good purpose if it encourages any reader to observe trees more closely, for, after all, books of popular science can do little more and nothing better than to stimulate habits of personal investigation.

Notes.

The great Botanic Garden at Buitenzorg, in Java, has the richest collection of Palms in the world. There are three hundred determined species and a hundred which appear distinct, although they are yet unnamed, besides varieties of known species, so that it may be said that there are at least four hundred different Palms cultivated there.

The Gardeners' Chronicle for August 22d contains the first part of a monograph by Mr. J. G. Baker on the genus Brodiæa and its allies. There has been so much confusion in the nomenclature of these American bulbous Liliaceæ that botanists and every one who grows these beautiful plants will feel under obligation to Mr. Baker for classifying and describing the species.

Trees of Magnolia cordata in this vicinity are giving a second crop of bloom this year, which, in truth, is not a very uncommon thing, but owing, perhaps, to the abundant rains and warm weather the bright canary-yellow flowers are rather more abundant than usual. This is now classed by botanists as a variety of the Cucumber-tree, M. acuminata, but the color of its flowers, its broader, more darkly green and more persistent leaves make it quite a distinct tree for garden purposes.

The so-called Japanese Wineberries, Rubus phœnicolasius, have been marketed, it seems, in limited quantities at Portland, Oregon, and in other cities on the Pacific coast during the present season. It is said that the fruit appears to be larger and better than it has been in former years, and it commands about the same price as Black Cap raspberries. We have never seen any of the fruit in this market, and should like to hear the experience of any persons who have grown this berry for sale.

Half-dead conifers by the hundred have been removed from Central Park during recent years, but too many still remain to mar the beauty of the landscape and often to impair the effect of well-grown adjacent trees or prevent younger ones from attaining symmetrical development. On the western edge of the East Drive, opposite McGown's Pass Tavern, there are a dozen decaying and unhappy-looking Spruces which could be cut out to the immediate profit of their neighbors and to the improvement of a picturesque bit of road.

At the last session of the Ohio Legislature an act was passed to prevent the spread of contagious diseases among fruit-trees, especially the yellows and the black-knot. The act provides for the destruction and burning of trees and fruits infected by the yellows, and, in accordance with its provisions, the experiment station has just issued a bulletin giving full information relative to the different diseases, with illustrations and with regulations and directions for marking and destroying the trees by the fruit commissioners of the various townships.

All kinds of fruit are now so abundant in this city that only the very best qualities are salable at remunerative prices. The best Bartlett pears in large barrels have brought $4.25 at wholesale; the few Seckels which have come to market have sold for as much as $5.00 a barrel. Plums are coming generally now from western New York, and good Green Gages bring only twenty-five cents a basket, and the best Lombards and Egg plums no more than forty cents. Grapes are abundant and cheap. A few Tokays, from California, brought $2.00 a box, but, of course, they have not as yet much color.

The city of Leipsic is encircled as far as the eye can reach by a monotonous plain. Many years ago the City Council ordered that all the refuse and ashes of the town should be deposited at a certain point in a suburb which is imaginatively called the Valley of Roses, a suburb which in reality shows no valley and is chiefly devoted to the cultivation of prosaic edible vegetables. Gradually this ash-mound, which has been named Mount Georgi, in honor of the burgomaster who decreed it, has risen to the imposing height of some 120 feet, and the Council recently appropriated the sum of ten thousand marks for the purpose of covering it with vegetation and erecting upon its summit an outlook tower which they assure the world will be a most attractive point of pilgrimage. Americans who read of the long effort which the citizens of Leipsic have been making to enliven the landscape ought to feel some compunctions of conscience at their neglect of the original and striking natural beauties of their own cities which are so often despised and destroyed.

The last number of *The Garden* contains a beautifully colored plate showing various hybrids of the Pheasant's-eye Narcissus, and in a brief, but instructive, article the Rev. G. H. Englehart calls attention to the wide range over which hybrid Narcissi have expanded, so as to embrace greater variety of form and color, since the blood of Narcissus poeticus has been introduced. Stately and beautiful as the Trumpet Daffodils are, there would be a considerable sameness among them without the Poeticus blood. Secondary crosses between N. incomparabilis and N. poeticus give the most brilliant scarlets and oranges by infusing the red in the eye of the latter into the highly colored hybrids which have already derived their color from the first cross. One of these figured hybrids has a cup of apricot-scarlet, another of clear yellow, with a perianth as purely white as that of N. poeticus itself. Mr. Englehart also notes that by intercrossing good forms of the Pheasant's-eye Narcissus and by seed selection this species is capable of great increase in size and enrichment of color, showing solid, bold, well-formed flowers almost twice the size of those of Poeticus ornatus and with large eyes deeply suffused or margined with fiery red.

Mr. George A. Cochrane, in writing to the *Country Gentleman* about foreign markets for our fall apples, says that the fruit crop in Europe for this year is likely to be no more than fair, but that there will still be an active demand for American apples if carefully selected and well packed. There are many varieties of fall apples growing in New England and New York which have been thought too tender for the long voyage across the sea, but since the introduction of fast steamers they could be exported with profit if packed in boxes holding half a barrel, with each piece of fruit wrapped in paper, as oranges and lemons are transported. The boxes recommended are similar in style to ordinary orange boxes with a middle piece, making two apartments, and nailed so as to leave a space of at least a quarter of an inch between the strips. Duchess, St. Lawrence, Alexander, Gravenstein, Snow and Wealthy, which will not carry safely in barrels, will carry perfectly well in these boxes, and in some instances a case of well-packed and well-selected fruit will bring as much as a barrel. It should be borne in mind that in England crisp apples with a hard meat are preferred. Soft-meated or mealy fruits, such as Porter, Williams and Astrachan, are not favorites.

Bulletin No. 45 of the Illinois Experiment Station is taken up with a record of the different kinds of Apple-trees which have been planted on the experimental farm of the University of Illinois, during the past twenty-seven years, and the following are the varieties which have given promise of the highest and most continuous value, taken in the order of their season of ripening: William Prince, Red Stripe, Hicks, Cole's Quince, Large Yellow Siberian Crab, Jefferies, Sharp's, Utter, Jonathan of Buler, Sweet Bellflower of Wyandotte County, McLellan, Higby Sweet, Mansfield Russet, Westfield Seek-no-further, Coon's Red, Ned, Indiana Favorite and Royal Limbertwig. The descriptions of all these apples and many more are given with great care and will be found a valuable supplement to the fruit lists of the Pomological Society or of local state societies. It is rather a singular fact that good authorities like Downing, Warder and Thomas differ so widely in their descriptions of the various characters of apples. One, for example, will describe the flesh of a certain apple as white, while another will call it yellowish. The truth is, as stated in this bulletin, that there are individual characters which it is impossible to describe accurately or minutely, but which, nevertheless, distinguish the variety. These are rarely all present in any one specimen, and it is not uncommon to find a number of specimens together, each of which or all of which lack some one very characteristic mark. As a rule, the more minute the description the more likely it is to fall into error. This comes (1) from individual variation, (2) from variation with the season, (3) from slight peculiarities, climatic differences, etc., because apples grown in one locality differ in form, quality and other characters from those grown in another. Descriptions which have been made of the same variety in different seasons often vary more or less, and sometimes vary so widely as to justify the supposition that they were made for different varieties. Fruit which is undoubtedly of the same variety is not always the same on different trees, and summer pruning and other cultural conditions are often potent in causing variation.